

Appl. No. 09/517,345
Amdt. dated September 15, 2005
Amendment under 37 CFR 1.116 Expedited Procedure
Examining Group 2811

PATENT

REMARKS/ARGUMENTS

Claims 1-2, 4, 6-25, 49-64, and 66-70 are pending. Claim 70 has been amended.
No new matter has been added.

In summary of the present Office Action:

Claims 1-2, 4, and 6-19 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Schueller, U.S. Pat. No. 5,866,949; in view of Zenner, U.S. Pat. No. 5,866,949; Freyman, U.S. Pat. No. 5,985,695; and Lau, "Chip on Board Technologies for Multichip Modules";

Claims 20-22, and 24 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Schueller in view of Kimura, U.S. Pat. No. 5,663,594;

Claims 23 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schueller, Freyman, and Kimura;

Claim 25 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schueller, Zenner, and Fukitomi, U.S. Pat. No. 5,796,912;

Claims 49-59 and 61 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Schueller, Zenner, and Freyman;

Claim 60 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schueller, Zenner, Freyman, and Lau;

Claims 62, 64, and 67 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Schueller in view of Zenner;

Appl. No. 09/517,345
Amdt. dated September 15, 2005
Amendment under 37 CFR 1.116 Expedited Procedure
Examining Group 2811

PATENT

Claim 63 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Schueller in view of Zenner and Fukitomi;

Claims 66 and 68 are rejected 35 U.S.C. § 103(a) as being unpatentable over Schueller in view of Zenner and Lau;

Claim 69 is rejected 35 U.S.C. § 103(a) as being unpatentable over Schueller in view of Zenner, Fukitomi, and Lau; and

Claim 70 is objected to for informalities.

The Applicants respectfully traverse all of these rejections and the objection.

I. Rejection of claims 1-2, 4, and 6-19 under 35 U.S.C. § 103(a).

Claim 1 recites, in part:

a silicon die having a first thickness; ...
wherein the transition medium has a second thickness,
the first thickness of the silicon die is less than the second thickness

The Applicants respectfully submit that the Examiner has failed to establish a prima facie case for obviousness because: A) the cited references do not disclose at least the above-recited claim limitations; B) the cited references provide no suggestion or motivation to combine or modify the references to satisfy the above-recited claim limitations; and C) the cited references do not provide any reasonable expectation of success.

A. The cited references do not disclose all of the claim limitations.

Appl. No. 09/517,345
Amdt. dated September 15, 2005
Amendment under 37 CFR 1.116 Expedited Procedure
Examining Group 2811

PATENT

The Applicants respectfully submit that none of the cited references disclose or suggest an integrated circuit package in which the thickness of the silicon die is less than the thickness of the transition medium.

In the present Office Action, the Examiner concedes that Schueller fails to teach that "the first thickness of the silicon die being less than the second thickness" of the transition medium.

Similarly, nothing in Zenner discloses or suggests silicon die that is thinner than a transition medium, because Zenner does not disclose or suggest any transition medium at all. Zenner does disclose an "electronic component 12 [bonded] to the substrate 14 with a thin layer of adhesive 16." (Zenner, Col. 3, lines 59-60). However, this adhesive layer is not a transition medium.

Moreover, even if the use of an adhesive layer were analogous to a transition medium, which it is not, this adhesive layer is always thinner than the silicon die. Zenner discloses that the silicon die should have a thickness "less than about 100 μm , preferably less than about 50 μm , and most preferably less than about 20 μm ." (Zenner, Col. 3, lines 54-58). For each of these examples, the respective adhesive layer is "less than about 50 μm thick, preferably less than about 25 μm thick, most preferably about 2-15 μm thick" (Zenner, Col. 4, lines 4-6). Thus, there is nothing in Zenner that discloses or suggests a silicon die that is thinner than a transition medium or any other layer of material between the die and substrate.

Freyman, Lau, and the other references cited by the Examiner similarly disclose a silicon die that is substantially thicker than the associated transition medium or any other layer of material between the die and substrate.

In summary, Schueller, Zenner, Freyman, and Lau each clearly discuss a silicon die having a thickness much greater than the associated purported transition medium. Thus, the Applicants respectfully submit that the cited references fail to disclose the claim limitation of "the first thickness of the silicon die is less than the second thickness."

Appl. No. 09/517,345
Amdt. dated September 15, 2005
Amendment under 37 CFR 1.116 Expedited Procedure
Examining Group 2811

PATENT

B. There is no suggestion or motivation to combine or modify the references to meet the claim limitations.

The Applicants respectfully submit that there is no suggestion or motivation to combine or modify the references to meet at least the above-recited claim limitation of "the first thickness of the silicon die is less than the second thickness."

MPEP 2143.01 states that "obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art." (MPEP 2100-130).

At page 29 of the present Office Action, the Examiner states that "Schueller further teaches using the transition medium/support structure having a second thickness/layer of 100-250 μm " and that Zenner teaches "using the die thickness of about less than 100 μm or preferable less than 20 μm ." However, "the mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. In re Mills, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990) (See MPEP 2100-131).

In this case, although the thickness of the electronic component disclosed by Zenner is coincidentally less than the thickness of the transition medium of Schueller, there is no suggestion in the prior art of desirability for this arbitrary combination of elements from different references. It is not disputed that Schueller only discloses a silicon die that is thicker than its disclosed transition medium. As discussed above, Zenner also only discloses an electronic component that is thicker than its adhesive layer. Neither of these references discloses or suggests a silicon die that is thinner than its transition medium or any reason why such an arrangement would be desirable.

Moreover, prior art must be considered in its entirety, including disclosures that teach away from the claims. "A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention." W.L.

Appl. No. 09/517,345
Amdt. dated September 15, 2005
Amendment under 37 CFR 1.116 Expedited Procedure
Examining Group 2811

PATENT

Gore & Associates, Inc. v. Garlock, Inc., 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984) (See MPEP 2100-127). In this case, both Schueller and Zenner disclose a silicon die that is thicker than its purported transition medium. As a result, these references cannot be combined to support the opposite configuration: a silicon die that is thinner than its transition medium.

Because both cited references disclose a silicon die that is thicker than its purported transition medium, there is no suggestion that the opposite configuration, wherein "the first thickness of the silicon die is less than the second thickness" of the transition medium, is desirable. Therefore, the Applicants respectfully submit that there is nothing in the explicit or implicit teachings of prior art that provide any motivation for the combination or modification of elements from the cited references as suggested by the Examiner.

C. The prior art provides no reasonable expectation of success for the modification or combination of the cited references.

MPEP 2143.02 states that "the prior art can be modified or combined to reject claims as prima facie obvious as long as there is a reasonable expectation of success." In re Merck & Co., Inc., 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986) (MPEP 2100-132). In the present case, the prior art suggests that combining or modifying elements to meet the claim limitation of "the first thickness of the silicon die is less than the second thickness."

As discussed above, Zenner discloses an electronic component bonded to the substrate with a thin layer of adhesive. According to Zenner, "the very thin adhesive layer will be able to tolerate the relaxation curvature described above. A thicker adhesive layer would not. Thin adhesive would further reduce the effects of thermal expansion on thermal excursions." (Zenner, Col. 2, lines 50-54). Thus, Zenner discloses that increasing the thickness of the adhesive layer, which is a necessary modification to satisfy the above-recited claim limitation, would lead to undesirable effects such as poor tolerance of the relaxation curvature and greater thermal expansion.

Appl. No. 09/517,345
Amdt. dated September 15, 2005
Amendment under 37 CFR 1.116 Expedited Procedure
Examining Group 2811

PATENT

As Zenner explicitly recites undesirable effects associated with an increased thickness of the transition medium, the Applicants respectfully submit that there is no reasonable expectation of success for the modification or combination of the cited references to meet the claim limitation of "the first thickness of the silicon die is less than the second thickness."

D. Summary

In light of the above remarks, the Applicants respectfully submit that A) the cited references do not disclose at least the above-recited claim limitations; B) the cited references provide no suggestion or motivation to combine or modify the references to satisfy the above-recited claim limitations; and C) the cited references do not provide any reasonable expectation of success. Therefore, the Applicants respectfully submit that claim 1 and its associated dependent claims are patentable and in condition for allowance.

II. Claims 20-22 and 24 are rejected under 35 U.S.C. § 103(a).

Claims 20-22 and 24 are rejected in view of Schueller and Kimura. Claim 20 recites, in part:

the die is disposed near a midline of the package thickness measured from the bottom of the metallized polymer layer to the top of the mold cap.

With regard to this claim limitation, the Examiner concedes that Schueller fails to disclose the "dimensions of the die, transition medium and the package being such that the die is disposed near midline of the package." Moreover, the Examiner does not cite any portion of Kimura that teaches this claim limitation. The Examiner states that "the determination of parameters such as . . . the relative position and an arrangement of various components within the package, etc. in chip packaging and encapsulation technology is a subject of routine experimentation and optimization."

The Applicants respectfully traverse this assertion that such parameters are "subject of routing experimentation and optimization" and respectfully request that the Examiner

Appl. No. 09/517,345
Amdt. dated September 15, 2005
Amendment under 37 CFR 1.116 Expedited Procedure
Examining Group 2811

PATENT

either provide documentary evidence to support this assertion against the above-cited claim element or withdraw this rejection. (See MPEP 2144.03).

Due to the absence of any documentary evidence against the above-recited claim limitation, the Applicants respectfully submit that claim 20 and its associated dependent claims are patentable and in condition for allowance.

III. Claims 23 is rejected under 35 U.S.C. § 103(a).

In light of the above remarks, the Applicants respectfully submit that claim 23 is patentable by virtue of its dependence on patentable independent claim 20.

IV. Claims 25, 49-61, 62-64, 66, 67-68, and 69 are rejected under 35 U.S.C. § 103(a)

Claim 25 recites, in part:

a die disposed on the second adhesive layer comprising a thickness that is less than the thickness of the transition medium

Claim 49 recites, in part:

an integrated circuit die having a front side, a back side, and a first thickness between the front and back sides, wherein bonding pads are formed on the front side; . . .

and

a transition medium comprising a mold compound, between the integrated circuit die and the metallized polymer layer, wherein the transition medium has a second thickness, greater than the first thickness,

Claim 62 recites, in part:

a silicon die comprising a thickness; . . .

wherein the transition medium comprises a thickness that is greater than the thickness of the silicon die,

Claim 67 recites, in part:

a silicon die having a first thickness; . . .

and

Appl. No. 09/517,345
Amdt. dated September 15, 2005
Amendment under 37 CFR 1.116 Expedited Procedure
Examining Group 2811

PATENT

a plastic encapsulant which encapsulates the silicon die and the transition medium, wherein the transition medium has a second thickness, the first thickness is less than the second thickness,

Claim 69 recites, in part:

a silicon die having a first thickness; . . .
a transition medium having a second thickness; and . . .
wherein the transition medium is disposed between the silicon die and the metallized polymer layer,
wherein the first thickness is less than the second thickness

For reasons similar to that set forth with regard to claim 1, the Applicants respectfully submit that the Examiner has failed to establish a prima facie case for obviousness of claims 25, 49, 62, 67, and 69 because: A) the cited references do not disclose at least the above-recited claim limitations; B) the cited references provide no suggestion or motivation to combine or modify the references to satisfy the above-recited claim limitations; and C) the cited references do not provide any reasonable expectation of success. Therefore, the Applicants respectfully submit these claims and their associated dependent claims are patentable for at least these reasons and in condition for allowance.

V. Claim 70 is objected to for informalities.

Applicants have amended claim 70 to depend from claim 1 and respectfully request the withdrawal of this objection.

Appl. No. 09/517,345
Amdt. dated September 15, 2005
Amendment under 37 CFR 1.116 Expedited Procedure
Examining Group 2811

PATENT

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are patentable and in condition for allowance and an action to that end is respectfully requested.

The Applicants invite the Examiner to contact the undersigned if the Examiner believes a telephone conference would expedite the prosecution of this application.

Respectfully submitted,



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